WHAT IS CLAIMED IS:

1. A plasma processing system comprising:

a processing vessel including a housing unit for containing a substrate-to-be-processed and a plasma generating unit communicated with the housing unit and having an insulator wall, for performing plasma processing on the substrate-to-be-processed;

a conducting mount disposed in the housing unit, for the substrate-to-be-processed to be mounted on;

antenna means disposed on the outside of the insulator wall, for forming induced electromagnetic fields in the plasma generating unit;

a first high-frequency electric power source for supplying high-frequency electric power to the antenna means;

gas supply means for supplying a plasma generating gas which is dissociated by the induced electromagnetic fields generated by the antenna means, and a processing gas for the plasma processing;

a conducting member disposed outside the insulator wall, opposed to the mount, being grounded to generate a vertical electric field between the substrate-to-be-processed and the conducting member; and

a second high-frequency electric source for supplying high-frequency electric power to the mount.

2. A plasma processing system comprising:

a chamber for housing a substrate-to-be-processed;

a belljar disposed on the chamber in communication with the chamber and having a side wall and a top wall of an insulator;

a conducting mount disposed in the chamber, for the substrate-to-be-processed to be mounted on;

an antenna means disposed on the outside of the side wall of the belljar, for generating induced electromagnetic fields in the belljar;

a first high-frequency electric power source for supplying high-frequency electric power to the antenna means;

gas supply means for supplying a plasma generating gas which is dissociated by the induced electromagnetic fields generated by the antenna means to be plasmas, and a processing gas for the plasma processing;

a conducting member disposed upper of the top wall, opposed to the mount, being grounded to generate a vertical electric field between the substrate-to-be-processed and the conducting member; and

a second high-frequency electric power source for supplying high-frequency electric power to the mount.

3. A plasma processing system comprising:

a chamber for housing a substrate-to-be-processed;

a belljar disposed on the chamber in communication with the chamber and having a side wall and a top wall of an insulator;

a conducting mount disposed in the chamber, for the substrate-to-be-processed to be mounted on;

an antenna means disposed on the outside of the side wall of the belljar, for generating induced electromagnetic fields in the belljar;

a first high-frequency electric power source for supplying high-frequency electric power to the antenna means;

gas supply means for supplying a plasma generating gas which is dissociated by the induced electromagnetic fields generated by the antenna means to be plasmas, and a processing gas for the plasma processing;

a Faraday shield disposed between the belljar and the antenna means;

a conducting member disposed upper of the top wall, opposed to the mount, being grounded to generate a vertical electric field between the substrate-to-be-processed and the conducting member; and

a second high-frequency electric power source for supplying high-frequency electric power to the mount.

4. A plasma processing system according to any one of claims

1 to 3, wherein

the mount has a heating mechanism for heating the substrate-to-be-processed.

5. A plasma processing method for performing plasma processing by using a plasma processing system comprising a chamber for housing a substrate-to-be-processed; a belljar disposed on the chamber in communication with the chamber and having a side wall and a top wall of an insulator; a conducting mount disposed in the chamber, for the substrate-to-be-processed to be mounted on; an antenna means disposed on the outside of the side wall of the belljar, for generating induced electromagnetic fields in the belljar; a first high-frequency electric power source for supplying high-frequency electric power to the antenna means; gas supply means for supplying a plasma generating gas which is dissociated by the induced electromagnetic fields generated by the antenna means to be plasmas, and a processing gas for the plasma processing; a flat conducting member disposed upper of the top wall, opposed to the mount, being grounded; and a second high-frequency electric power source for supplying high-frequency electric power to the mount,

high-frequency electric power being supplied from the second high-frequency electric power source to the mount to generate electric fields vertical to the substrate-to-be-processed between the mount and the conducting member and generate plasmas, and then high-frequency electric power being supplied from the first high-frequency electric power source to the antenna means to generate induced electromagnetic fields in the belljar and generate inductive coupled plasmas, whereby the plasma processing is made on the substrate-to-be-processed.

6. A plasma processing method for performing plasma processing by using a plasma processing system comprising a chamber for housing a substrate-to-be-processed; a belljar disposed on the chamber in communication with the chamber and having a side wall and a top wall of an insulator; a conducting mount disposed in the chamber,

for the substrate-to-be-processed to be mounted on; an antenna means disposed on the outside of the side wall of the belljar, for generating induced electromagnetic fields in the belljar; a first high-frequency electric power source for supplying high-frequency electric power to the antenna means; gas supply means for supplying a plasma generating gas which is dissociated by the induced electromagnetic fields generated by the antenna means to be plasmas, and a processing gas for the plasma processing; a Faraday shield disposed between the belljar and the antenna means; a flat conducting member disposed upper of the top wall, opposed to the mount, being grounded; and a second high-frequency electric power source for supplying high-frequency electric power to the mount,

high-frequency electric power being supplied from the second high-frequency electric power source to generate electric fields between the mount and the conducting member to ignite plasmas, and then, high-frequency electric power being supplied form the first high-frequency electric power source to the antenna means to generate induced electromagnetic fields in the belljar to generate inductive coupled plasmas, whereby the plasma processing is made on the substrate-to-be-processed.

7. A plasma processing method according to claim 6, wherein

the second high-frequency electric power source stops supplying high-frequency electric power after the first high-frequency electric power source has started the supply of the high-frequency electric power.

8. A plasma processing method according to any one of claims 5 to 7, wherein

the plasma processing is performed while the substrate-to-be-processed is being heated.

9. A plasma processing method according to claim 8, wherein

the plasma processing is for removing natural oxide films formed on the substrate-to-be-processed.

10. A plasma processing method according to claim 9, wherein the plasma generating gas and the processing gas are argon gas and hydrogen gas.

11. A plasma processing method according to claim 10, wherein the first high-frequency electric power source is connect to an upper end portion of the antenna means.

12. A plasma processing system according to any one of claims 1 to 4, wherein
the conducting member is flat.

13. A plasma processing system according to claim 12, wherein the first high-frequency electric power source is connect to an upper end portion of the antenna means.